

**GE Brassica - GMF 06001 at Plant and Food, Lincoln, Boundary Road, Canterbury. Three significant ERMA Controls have been broken at the site of GMF06001 namely**

- 1.8 Brassica oleracea plants shall be prevented from producing open flowers in the field test site. Plants identified as initiating bolting must either be immediately moved back into a containment structure (control 1.4) or killed (control 1.12).
- 6.3 During the period when GM brassicas are present in the field test site, the site shall be monitored to detect the onset of bolting or early flower opening using a scientifically validated method and staff appropriately trained in that method. Monitoring intervals shall be appropriate to the developmental stages of the brassicas to detect the onset of bolting or early flower opening. Any plants detected as initiating bolting or with early flower opening will be contained as set out in control 1.8.
- 6.5 At the end of each growing season, the entire field test site shall be monitored monthly to detect any GM volunteer plants. A log of these monitoring events shall be maintained and it shall record the date, details of any GM *Brassica* plants found and any action taken.

We would like ERMA to re-assess the application GMF06001 and follow the infringement offence protocols that are set down in the Act under section 109 (e)(i), 114 (1), 115 (1), 116(b) and 124.

Time line:

- 1) In September 2008 the trial site GMF 06001 ended its seasonal trial.
- 2) Plant material (9/2/08) was dug in and left it to rot down for further research.
- 3) The site had suffered from severe weather patterns from snow, wind to floods and the kale plants were notably affected by the weather.
- 4) The broccoli plants had shown early bolting behaviour and were removed from the site by late July.
- 5) Removal of all GE material was incomplete and the Forage Brassica was cut 4-6 inches from the ground, leaving the roots in the soil.
- 6) The forage kales were not disposed of properly and they were not monitored for at least two months.
- 7) Regeneration of plant material from cut stalks did occur.
- 8) The area in which the trial had taken place was left littered with stalks and buffer plants.
- 9) The re-growth of at least 20 plants of genetically engineered (GE) *Bacillus thuringiensis* (Bt) forage kale was evident by the labels at the foot of the plants.
- 10) One plant a kale or broccoli (pl 23 CRY1Ba1 #1) showed that it had been un-monitored. It had a well defined seed pod with the outline of seeds maturing, above the pod were another four stalks that had had seed pods but they had dropped off and above that there were three yellow flowers in the process of opening. There were also eight unopened curds.
- 11) When the person in charge was advised of the flowering plant she was unable to be contacted.
- 12) The offending flowering stem had been snapped off to remove evidence.
- 13) MAFBNZ and Plant and Food denied any breach when visiting the site.
- 14) ERMA controls specifically state that all material at the end of the seasonal trial is to be cleared up and disposed of in a scientifically validated manner, namely autoclaved, or kept for further research.
- 15) Control states that under no conditions are plants to be allowed to flower.

**ERMA Decision on the field site** - The public were assured by ERMA and the Applicant in the Summary document of GMF 06001 and in the ERMA Decision that the expertise of the staff, the inspection and monitoring would ensure that flowering of the Bt Brassica would not occur.

The Crop and Food Application states:

**“The field test will be monitored carefully every 3-4 days to ensure that no caterpillars are surviving on transgenic plants and that no open flower buds are visible on the plants. Plants will be removed when they initiate bolting and therefore well before flowers open to ensure no dispersal of genetically modified pollen... The personnel associated with this field test are**

experienced with conducting field tests of genetically modified plants and are trained in the procedures associated with such field tests.” (GMF 06001 p. 5)<sup>1</sup>

The ERMA decision controls outline 8 points for the containment of the GE brassica and for the management of any risks. The controls of interest in this case are

- the containment of the genetically modified organisms and any heritable material from these organisms;
- disposal of brassica plant material;
- removal of all brassicas from the field test site before flower bud opening (and thus pollen release) can occur;
- monitoring and inspections both during the field test and after its completion.

The ERMA Authority deemed that “all identified potentially significant adverse effects (risks and costs) of the organisms were assessed as negligible [after] taking into account containment provisions and other controls required by this decision. (ERMA decision p3/47)<sup>2</sup>.

### **Background:**

The Lincoln area is a large patchwork of horticultural and agricultural fields. The GMF06001 site is situated in Boundary Road. P.G Wrightsons is about 1.2 km north and the Heinz Watties Organic Farm and Biological husbandry Unit 1.2 km south of the site. The surrounding area is private and Plant and Food experimental land.

In May 2007 ERMA approved the GMF06001 field trial to genetically engineer cabbage, cauliflower and broccoli and forage kale with an insecticidal gene *Bacillus thuringiensis* (*Bt*) with controls the main one being no flowering of GE brassica allowed in the undisclosed field test site. so all plants were to be removed once “bolting” was detected.

When Brassica initiate bolting a head formed with tight curds (buds). (Cauliflower and broccoli are unopened tight flower buds). A stalk then elongates over two weeks. When flowering starts it is from the base and moves up the stalk, flowering continues for about one month in cauliflower and for 20–25 days in broccoli plants. Seeds are mature 45–50 days after opening of flowers. The pod reaches its maximum length 3–4 weeks after flowering. Leaf cabbage (Kale) flowers over 1–2 months. Isolation of flowering crops should be over 1 km from other flowering *Brassica oleracea* plants due to of the strong outcrossing possibility.

Verdil et al report that the coincident flowering between cauliflower affects directly the productivity and the genetic quality of the produced hybrid seeds. The closer the flowering time between the lines, the greater the number of seeds per silique and the greater the percentage of hybrid seedlings<sup>3</sup>.

Brassica flowers are insect pollinated, mainly by bees, MAF has noted that bees fly up to 3.7 km from their hives but have been known to go as far as 10 km when foraging<sup>4</sup>.

Dr Howlett noted that in Canterbury there were a range of native insect pollinators present in onion and brassica crops with a wide variation even on sites close together; that there were as many native insects as there were honey bees and that these native pollinators carried similar pollen load as bees<sup>5</sup>.

As noted in the Crop and Food annual report of July 2008 to ERMA -

**“All plants were removed prior to flowers opening thus preventing the release of heritable material from the trial site. No evidence of bolting or floral initiation was noted on any of the cabbage or the majority of forage kale plants grown in**

<sup>1</sup> Application for approval to Field Test In Containment Any Genetically Modified Organism under section 40 of the Hazardous Substances and New Organisms Act 1996, GMF06001, Jenny Khoo, 30/10/06.

<sup>2</sup> Environmental Risk Management Authority Decision GMF 06001, 25<sup>TH</sup> May 2007.

<sup>3</sup> Verdail M., Cardosa A., de Lima M., Chaves F., 2001, Coincidence of flowering time and the productivity and quality of cauliflower hybrid seeds Sci. agric. v.58 n.3. doi: 10.1590/S0103-90162001000300015, retrieved 16/1/09.

<sup>4</sup> Minimising inclusion of GM material in bee products MAF rural NZ, <http://www.maf.govt.nz/mafnet/rural-nz/research-and-development/biotechnology/literature-review-gm-plants-and-bee-products/gm-plants-bees-05.htm>

<sup>5</sup> Native flies may be important crop pollinators, 2005, Katherine Trought, Crop and Food. <http://www.crop.cri.nz/home/news/archives/2005-2007/1130195378241.php>

**the trial. This is expected as a sufficient period of cold inductance (vernalisation) had not yet been experienced”<sup>6</sup>.**

Dr Christey did not document how many forage kale plants initiated bolting or floral initiation, however it is important to note that this was a strong indication that bolting in kale was predictable as the September months had snow and cold conditions.

Claire Bleakley (GE Free NZ) with Steffan Browning (Soil and Health) visited the trial site, two and three times respectively, over the last 5 months. August, December 2008 and January 2009

In August the GE field site was observed with fully grown forage kale plants and brassica buffer or guard row plants defined by their red colour. The buffer row plants also belong to the “*Brassica oleracea*” family though phenotypically (colour) different. An implement shed, plastic compost bin and blue brush hanging off the fence were on the site.

### **Breach 1: Control 1.8 –**

ERMA assurance –

**4.3.25 One of the key aspects of this proposed field test is that GM brassica’s are not allowed to flower while in the test site”. (ERMA E&R Report p.44/216)<sup>7</sup>**

**2.5.18 The Committee considers... the Operator could identify and remove all flowering GM brassicas in advance of pollen being dispersed. (ERMA Decision p.15/47).**

**2.5.19 “... the containment of the GM brassicas depends largely on preventing the opening of flower buds within the field test site” (ERMA Decision p.16/47).**

**2.5.20 The Committee considers that these containment measures would ensure that it is highly improbable that GM brassica plants could escape from containment through flowering and dispersal of pollen. (ERMA Decision p16/47)<sup>8</sup>.**

The Applicants assurance -

**“Plants will be removed when they initiate bolting and therefore well before flowers open to ensure no dispersal of genetically modified pollen”.**

**“At the end of the field test, plants will be removed from the field and either destroyed by autoclaving or replanted into a contained PC2 greenhouse for flowering and seed collection”. (GMF 06001 p. 5)<sup>9</sup>**

On December 22<sup>nd</sup> 2008, at the Boundary Road GMF06001 trial site was visited twice over 24 hours firstly in the evening where the flowering plant was seen then the next day, with a journalist.

The buffer row red brassica had regenerated from cut stalks and were fully flowering with seed pods.

Inside the buffer row where the genetically modified Bt forage kale had stood there were 4-6 inches of stalk above the ground with over 20 stalks showing robust leaf regrowth, of which some stalks had three formed plantlets. Some of the leaf material showed evidence of caterpillar damage other plants were un-damaged. One plant, pl 23 CRY1Ba1 #1, had two flower stalks, a seed pod (silique) with clearly defined seeds, evidence of a further 5 bracts where the seed pods had fallen off; two flowers opening and eight unopened curds.

There is a strong likelihood that the buffer row plants have been pollinated by one of the adventitious flowers and produced a GE hybrid as both buffer and GE brassica plants were flowering at the same time.

The CRY plant seed pod was about 4-5 cms in length. Pods this length indicate that the flower was pollinated at least 21-30 days before detection. The bolted stalk must have been clearly evident at

<sup>6</sup> Crop & Food Research Confidential Report No 2210 Report on GMF06001 GM *Bt Brassica* Field Test M C Christey, July 2008 <http://www.erna.govt.nz/no/compliance/2008%20GMF06001%20Annual%20Report.pdf> retrieved 16/1/09.

<sup>7</sup> ERMA NZ Evaluation and Review report GMF0600, 2007

<sup>8</sup> Environmental Risk Management Authority Decision GMF 06001, 25<sup>TH</sup> May 2007.

<sup>9</sup> Application for approval to FIELD TEST IN CONTAINMENT ANY GENETICALLY MODIFIED ORGANISM under section 40 of the Hazardous Substances and New Organisms Act 1996, GMF06001, Jenny Khoo, 30/10/06.

the last monitoring event, as the start of curd evidence is at around 21 -30 days before flowers open and another three weeks to reach the full silique length.

There is a strong possibility that the delayed time in detecting the flowering plant with the evidence of five dropped and one existing silique, showing advanced seed formation, that GE pollen may have been insect spread outside the containment facility. It is not feasible to disregard this possibility even if the Authority deems it “negligible” that such an occurrence could occur, as they also deemed it “highly improbable” that pollen would escape.

### **Conclusion:**

Control 1.8 breach is the first offence under HSNO Act 109 (e).

*“Brassica oleracea plants shall be prevented from producing open flowers in the field test site. Plants identified as initiating bolting must either be immediately moved back into a containment structure (control 1.4) or killed (control 1.12)”.*

### **Breach 2: Control 6.3**

ERMA’s understanding:

**2.5.27 “Control 6.5 requires visual inspection of the site following removal of brassica’s at the end of each growing season... at monthly intervals”. (ERMA Decision p17/47).**

**4.4.13 “The project team considers that the experience of the staff involved would mean that escape through inadvertent human error is “highly improbable” (ERMA E&R Report p.54/216).**

The Applicants assurance:

***The field test will be monitored carefully every 3-4 days to ensure that ... no open flower buds are visible on the plants. The personnel associated with this field test are experienced with conducting field tests of genetically modified plants and are trained in the procedures associated with such field tests.***

Vernalisation, water stress, heat /cold can initiate bolting. Kale is known to be propagated from cloning of plants from stem stock.<sup>10</sup>

The robust regrowth of the brassica plants both GE and Buffer, from the roots and stems calls into account the quality and the regularity of the monitoring. The plant’s in the site were obviously not regularly monitored through any “scientifically validated manner” or as it appears even visually. Further, it was highly unlikely that any monitoring would have been undertaken before the first week of January as it was statutory holidays and the lead researcher Mary Christey was unable to be contacted.

This is negligent and though evidence of preparation of the site for transplanting the new crop had occurred, no one had taken time to inspect the plot.

ERMA must in its own capacity take some responsibility in the fact that submitter’s evidence was ignored and the Authority decision on GMF 06001 made some very significant errors.

The E&R report found that pollen escape was “highly improbable” so did not weigh it up as a risk if it did occur.

In the decision document the Authority states –

**2.5.31 “The Committee considers this [control] appropriate as brassicas do not regenerate through vegetative reproduction (root stock or material left in the soil)” (ERMA decision p18/47).**

<sup>10</sup> Brassica oleracea L(leaf cabbage) [http://database.prota.org/dbtw-wpd/exec/dbtwpub.dll?AC=QBE\\_QUERY&BU=http://database.prota.org/search.htm&TN=PROTAB~1&QB0=AND&QF0=Species+C&QI0=Brassica+oleracea+leaf+cabbage&RF=Webdisplay](http://database.prota.org/dbtw-wpd/exec/dbtwpub.dll?AC=QBE_QUERY&BU=http://database.prota.org/search.htm&TN=PROTAB~1&QB0=AND&QF0=Species+C&QI0=Brassica+oleracea+leaf+cabbage&RF=Webdisplay) , retrieved 16/01/09

The offending plants re generated from root stock, submitters raised in evidence this eventuality, yet it was ignored. It appears that the committee was not well enough informed about the life cycle of Brassica to realise that heritable material can re grow from stems and roots.

The dismissal of such concerns shows that the “scientific and agronomic expertise’ of the ERMA committee and staff is reliant on poor research and lack of understanding of the nature of the plant material it is dealing with.

The Plant and Food researchers and staff negligence and recklessness calls into question their professed extensive experience, training and expertise.

Plant and Food were notified when the offending plant was detected, and on second site visit in the same day the flower stalk had been snapped off. It is not known who did this, what precautions were taken in this event or how the plant material was disposed of.

The Christchurch Press reported on the surprise visit to the field site on the 24<sup>th</sup> December 2008. Despite photographic evidence to show a pollination event had occurred MAF were quoted in the Press newspaper article saying that no breach had occurred and everything was compliant<sup>11</sup>.

On the 12<sup>th</sup> January 2009 the CEO Mr Bruce Campbell conceded that it was a volunteer kale plant in a Radio NZ interview<sup>12</sup>.

**Conclusion:** Breach of control 6.3 is the second offence under HSNO s:109 (e)

***During the period when GM brassicas are present in the field test site, the site shall be monitored to detect the onset of bolting or early flower opening using a scientifically validated method and staff appropriately trained in that method. Monitoring intervals shall be appropriate to the developmental stages of the brassicas to detect the onset of bolting or early flower opening. Any plants detected as initiating bolting or with early flower opening will be contained as set out in control 1.8.*** (ERMA Decision p45/47).

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<sup>11</sup> Surprise check on field trial, David Williams - The Press, 24 December 2008, <http://www.stuff.co.nz/thepress/4802039a24035.html>

<sup>12</sup> Safety breach during gm trial

<http://www.radionz.co.nz/news/stories/2009/01/12/12459800051c>

<http://www.scoop.co.nz/stories/SC0901/S00010.htm>

[http://greenbio.checkbiotech.org/news/call\\_ge\\_field\\_trials\\_be\\_closed](http://greenbio.checkbiotech.org/news/call_ge_field_trials_be_closed)

### **Breach 3: Control 6.5**

ERMA's understanding –

**2.5.24** The Committee notes that to ensure the proper disposal of plants used in the buffer rows, these shall be phenotypically different from the GM brassica plants (control 7.4). (ERMA decision p 17/47).

**2.5.26** *“The Committee notes that control 1.12 requires that at the end of each growing season, all GM brassica plants have to be removed from the field test site, and those not retained for research purposes, shall be disposed of using a scientifically validated method”.* (ERMA decision p.17/47).

**4.3.33** “The plants in the field will be grown to marketable maturity and then the entire plant will be dug up by hand”. (ERMA E&R Report p.45/216).

**4.3.38** “At harvest the buffer rows of non transgenic plants surrounding the field test will be harvested via hand picking and then composted. Any plants in the experimental plots with bolting heads will be completely removed before flowering”. ((ERMA E&R Report p.46/216).

The site visit on the 22<sup>nd</sup> December 2008 had not been cleaned up after the growing season and the site was littered with GE stem and leaf detritus material, labels, and re-generated brassica both, GE and buffer, plants.

On the 12<sup>th</sup> January 2009, the site had been ploughed down one end. The shed had plastic bags, socks and a glove strewn beside it. The Compost bin was filled with flowering brassica plant material, dried up and would not be able to “hot” compost, thereby destroying the seeds. It is not known whether the flowering GE shoot was placed in the bin. If this is the case the bin material needs to be immediately autoclaved once testing for the presence of any GE material has occurred.

In spite of MAF and Plant and Food having visited the site the GE brassica plot had not been cleaned up and all GE material removed. The site still had stems some attached to roots, labels, an old jar left out. The offending re-generated stalk and roots had been dug up and left lying on the ground, a small GE root that had been missed was re-sprouting with evidence of curd development.

The applicant did not clean up the site after the growing season and MAF did not enforce the requirement of the total removal of heritable material or the clean up of the site after the growing season.

This shows that despite MAF saying that no breach had occurred and plant and food were compliant, inspection and monitoring of the site had missed this plant. It appears that MAF have been sloppy in enforcing the controls that are required under the memorandum of Understanding (MOU) with ERMA over field test sites.

It is not acceptable that sites held in secret locations should be open to such abuse. If we had not made an effort to locate this site these breaches would have gone undetected. The immediate denial of any breach made by MAF is very concerning and incriminates their integrity in the cover up.

**Conclusion:** Breach of control 6.5 is the third offence under HSNO Act s:109(e) (i).

***At the end of each growing season, the entire field test site shall be monitored monthly to detect any GM volunteer plants. A log of these monitoring events shall be maintained and it shall record the date, details of any GM Brassica plants found and any action taken.*** (ERMA decision p 45/47).

#### **Summary:**

1. ERMA must close down the trial site in Lincoln following the flowering of a forage kale plant genetically engineered (GE) with CRY1Ba1 gene. The site also had up to 10 GE brassica plants that had re grown from the 4-6 inch stems with roots that had been cut off and left in the ground.
2. ERMA must heed the submitters concerns in light of the serious errors in the GMF06001 decision
  - The consideration that brassica root material does not regenerate. 2.5.31
  - Using the same plant species as buffer row plants.
  - Allowing flowering of the buffer “Brassica oleracea” to occur,

3. The site had not been monitored for volunteer plants on a monthly basis and the lead researcher was going on holiday the day the flowering plant was observed 22/12/08. Leaving the possibility of the other Bt plants to bolt and flower.
4. The Site had not been cleaned up after the growing season and the site was littered with GE stem and leaf detritus material, labels, jar and re generated plants.

These breaches directly contravene Controls 1.8, 6.3 and 6.5.

- 1.8 Brassica oleracea plants shall be prevented from producing open flowers in the field test site. Plants identified as initiating bolting must either be immediately moved back into a containment structure (control 1.4 or killed (control 1.12).
- 6.3 During the period when GM brassicas are present in the field test site, the site shall be monitored to detect the onset of bolting or early flower opening using a scientifically validated method and staff appropriately trained in that method. Monitoring intervals shall be appropriate to the developmental stages of the brassicas to detect the onset of bolting or early flower opening. Any plants detected as initiating bolting or with early flower opening will be contained as set out in control 1.8.
- 6.5 At the end of each growing season, the entire field test site shall be monitored monthly to detect any GM volunteer plants. A log of these monitoring events shall be maintained and it shall record the date, details of any GM *Brassica* plants found and any action taken.

HSNO Act liability issues. -

1. This event is a serious breach of controls 1.8, 6.3, 6.5 and are an offence under the HSNO Act s:109 (e) (1) and
2. The correct penalty enforcement protocols must be instigated under 124B (2)(c).
3. The breach requires the closure of the field trial and the permit of the operator/employee of Plant and food, to conduct such trials be revoked under HSNO 115 (1).
4. The body corporate, Plant and Food, must have their GE permit revoked and order a cessation of the field trial GMF06001 under 114 (1).
5. The Directors of Plant and Food must also be held accountable under HSNO s:116 (b) as they failed to take reasonable steps to prevent the breach occurring.

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**Date: 18 Jan 2009**

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